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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/752,642

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EXAMINER

CHU, CHRIS C

ART UNIT

PAPER NUMBER

2815

MAIL DATE

DELIVERY MODE

06/06/2008

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/752,642	Applicant(s) NAKAMURA ET AL.	
	Examiner CHRIS C. CHU	Art Unit 2815	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 21 April 2008.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1 - 14 is/are pending in the application.
- 4a) Of the above claim(s) 5 - 10, 13 and 14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1 - 3, 11 and 12 is/are rejected.
- 7) ☒ Claim(s) 4 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 29 February 2008 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Applicant's amendment filed on April 21, 2008 has been received and entered in the case.

Election/Restrictions

2. This application contains claims 5 – 10, 13 and 14 drawn to an invention nonelected with traverse in the reply filed on September 18, 2007. A complete reply to the final rejection must include cancellation of nonelected claims or other appropriate action (37 CFR 1.144) See MPEP § 821.01.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 1 – 3, 11 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Chan et al. (U. S. Pat. No. 6,468,906) in view of Jan (U. S. Pat. No. 6,861,758).

Regarding claim 1, Chan et al. discloses in e.g., Fig. 1F a semiconductor device (10; column 2, line 47) having a multilayer structure (see e.g., Fig. 1F), comprising:

Art Unit: 2815

- at least two wiring layers (16 and 24; column 2, line 64 and column 3, line 61), each formed in a wiring groove formed in a corresponding insulating film (12 and 20; column 2, line 56 and column 3, line 29); and
- a via contact (the via contact that is formed in the layer 18) embedded, in a via hole (the via that is formed in the layer 18) formed in an insulating film (18; column 3, line 22) formed between the at least two layers (16 and 24) and made of a metal wiring material which is the same as that of the at least two wiring layers (16 and 24; column 2, line 64, column 3, line 61 and see e.g., Fig. 1F).

Chan et al. does not disclose an additive within the metal wiring material of the via contact. Jan teaches in e.g., Fig. 9 a metal wiring material (the material that is located between the elements 132 and 142, i.e., 144; column 4, lines 31 – 47 and column 2, lines 49 – 51) of the via contact (the via between the elements 142 and 132) containing an additive (the dopant material; column 2, lines 45 – 46) which is not contained in the metal wiring materials of the at least two wiring layers (132 and 142). It would have been obvious to one of ordinary skill in the art at the time when the invention was made to apply the dopant material of Jan as the specific material to form the additive within the metal wiring material of the via contact of Chan et al. as taught by Jan to inhibit electromigration (column 3, lines 1 – 12).

Regarding claims 2 and 12, Chan et al., as modified, discloses in e.g., Fig. 1F the metal wiring material (132 and 142 and/or 16 and 24) being Cu (column 2, lines 45 – 47 and/or column 2, line 64 and column 3, line 61) and the additive (the dopant material) being Sn, Rh, Zn, Al, Ru, Cr, Pd, In, Mg, Co, Zr, Ti, Ag, Ir, Ni, Ge, Nb, B, Or Hr (column 2, lines 49 – 51).

Art Unit: 2815

Regarding claim 3, Chan et al., as modified, discloses in e.g., Fig. 1F the metal wiring material (132 and 142 and/or 16 and 24) being Al (column 2, lines 45 – 47 and/or column 4, lines 59 – 61) and the additive (the dopant material) being Cu or Si (column 2, lines 49 – 51).

Regarding claim 11, Chan et al. discloses in e.g., Fig. 1F a semiconductor device (10) comprising:

- a first metal wiring layer (16) made of a first wiring material (column 2, lines 45 – 47), formed in a first wiring groove formed in a first insulating film (12) on a semiconductor substrate (the semiconductor substrate of the semiconductor device 10; column 2, lines 53 – 59);
- a second insulating film (18) on the first insulating film (12) having the first wiring layer (16) embedded therein (see e.g., Fig. 1F);
- a via contact (the via contact that is formed in the layer 18) embedded in a via hole (the via that is formed in the layer 18) formed in the second insulating film, the via contact (the via contact that is formed in the layer 18) being made of the same wiring material as the first wiring material (column 2, line 64, column 3, line 61 and see e.g., Fig. 1F);
- a third insulating film (20) on the second insulating film (20) having the via contact formed therein (see e.g., Fig. 1F); and
- a second metal wiring layer (24) embedded in a second wiring groove (the opening within the layer 20) formed in the third insulating film (20; see e.g., Fig. 1F), the second metal wiring layer (24) being made of the same metal wiring material as the

metal wiring material of the first metal wiring layer (16; column 2, line 64, column 3, line 61 and see e.g., Fig. 1F).

Chan et al. does not disclose an additive within the metal wiring material of the via contact. Jan teaches in e.g., Fig. 9 a metal wiring material (the material that is located between the elements 132 and 142, i.e., 144; column 4, lines 31 – 47 and column 2, lines 49 – 51) of the via contact (the via between the elements 142 and 132) containing an additive (the dopant material; column 2, lines 45 – 46) which is not contained in the metal wiring materials of the at least two wiring layers (132 and 142). It would have been obvious to one of ordinary skill in the art at the time when the invention was made to apply the dopant material of Jan as the specific material to form the additive within the metal wiring material of the via contact of Chan et al. as taught by Jan to inhibit electromigration (column 3, lines 1 – 12).

Allowable Subject Matter

5. Claim 4 is objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

(A) Claim 4 contains allowable subject matter because none of references of record teach or suggest, either singularly or in combination, at least the limitation of a metal wiring material being Ag and the additive being Cu.

Response to Arguments

6. Applicant's arguments filed on April 21, 2008 have been fully considered but they are not

persuasive.

On page 7, applicant argues “[I]n Jan, as shown in Fig. 9, the additive is included in the electrically conductive layer 132 and the electrically conductive material 142. Therefore, Jan cannot have the feature of the present invention ‘wherein the metal wiring of the via contact contains an additive which is not contained in the metal wiring materials of the at least two wiring layers.’” This argument is not persuasive because the additive material being diffused into the lower and upper wirings does not make the additive not in the via. Furthermore, since Jan reference clearly teaches the additive within the via and the Chan et al. teaches the other limitations, hence the combined structure of Jan and Chan et al. discloses every structural limitations of the claimed invention including “wherein the metal wiring of the via contact contains an additive which is not contained in the metal wiring materials of the at least two wiring layers.”

For the above reasons, the rejection is maintained.

Conclusion

7. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

Art Unit: 2815

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to CHRIS C. CHU whose telephone number is (571)272-1724. The examiner can normally be reached on 11:30 - 8:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Parker can be reached on 571-272-2298. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Chris C. Chu
Primary Examiner
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Primary Examiner, Art Unit 2815
Tuesday, June 03, 2008